A comparison of the variational solution to the Neumann geodetic boundary value problem with the geopotential model EGM-96

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A b s t r a c t : The Neumann geodetic boundary value problem (NGBVP) represents an exterior oblique derivative problem for the Laplace equation. The Neumann boundary conditions in the form of surface gravity disturbances correspond to derivatives of the unknown disturbing potential. The boundary element method (BEM) as a numerical method based on the variational formulation of the Laplace equation is applied to NGBVP. This approach gives a variational (approximate) solution directly on the earth's surface, where the classical solution could be hardly found.

This paper discusses the 3D BEM application to NGBVP. It represents a new approach to the global quasigeoid modelling. The collocation technique with linear basis functions is applied for deriving the linear system from the boundary integral equations. With respect to a giant size of the Earth, and in order to get accuracy as high as possible, computing on high-speed parallel computers is necessary. The Global Quasigeoid Models as the numerical results for two input data sets are compared with the geopotential model EGM-96.

Key words: the Neumann geodetic boundary value problem, boundary element method, variational solution, collocation method, linear basis functions, global quasigeoid modelling

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